

XXII.—Notes on the Permian System of the Counties of Durham and Northumberland. By RICHARD HOWSE, South Shields.

[Continued from p. 52.]

CONCHIFERA.

17. *PECTEN PUSILLUS*, Schloth.—The author of the ‘Perm. Monog.’ has, in translating Goldfuss’s specific description of this little shell into his ‘Monograph’ and into English, made a little too free with the Latin original. In the ‘Monog.,’ “*antica valvæ dextræ majori subplicata*” is rendered, “the fore part of the right valve in a great degree subPLICATE.” Now this is both contrary to fact and to Goldfuss’s German description as well as to the Latin, and might lead to a little confusion hereafter.

This *Pecten* is described as smooth by all authors, and such is its most general appearance; but when the shell is perfect and well preserved, there are to be seen all over its outer surface fine striæ of growth running parallel to the lower margin. Also on many specimens numerous fine lines radiate from the umbones to the same margin. The hinge-line is furnished in some individuals with an area of comparatively great size, but generally it is so small as not to be observable.

Some specimens of a *Pecten* which are found in a peculiar yellow conglomerate near Gera in Germany have lately been elevated into a species by Baron Schauroth under the name of *Pecten Macrothi*. I have examined some fragments of this shell obligingly sent to me by this learned Permian palæontologist, and I am sorry that I am obliged to consider the distinguishing character which he has pointed out as not of sufficient value to constitute a species. The chief character mentioned as peculiar to this new shell is the distant, very flat lines of growth parallel to the margin. But this is, as above stated, the perfect appearance of the surface of *Pecten pusillus*, to which the *Pecten Macrothi*, I have no doubt, belongs.

This species occurs most abundantly in the shell-limestone of Humbleton, and sparingly in all the other localities mentioned in the Table. It is also stated in the ‘Perm. Mon.’ to occur in the compact limestone at Whitley and Tynemouth.

17 a. *LIMA PERMIANA*, King.—Though I had taken single valves of this shell many years ago, yet the slight distinguishing characters it presented have always prevented me from considering it distinct from the preceding. But Mr. Kirkby has, with his usual success, obtained such a fine series of it from the places mentioned in the Table, that its admission into the fauna can be no longer safely resisted. It has also been discovered by Baron

Schauroth at Poessneck; and some examples kindly sent me for comparison agree with ours in every particular.

It differs from the preceding chiefly in the obliquity of the valves, in the narrowness of the hinge-line, and the more triangular appearance of the area. It has also no byssal notch. The surface, in perfect specimens, is ornamented with fine parallel lines of growth, and small radiate depressions run from the umbones to the margin. For the present, it may be left in the genus *Lima*, but this requires further examination.

In the shell-limestone of Tunstall and other localities; not very common.

18. *MONOTIS SPELUNCARIA*, Schloth.—Certainly no one at all conversant with this pre-eminently characteristic Permian bivalve can assent to its being unnecessarily broken up into three species, as proposed by the author of the 'Perm. Mon.'

As pointed out in the Tyneside Catalogue*, the convex valve when perfect exhibits "a few strong, imbricated or granulated diverging ribs, between which there are others much finer and closer together." The granulations are strongest on one side of the valve, and occur only on those specimens that are of very regular growth. On the coarser and larger individuals the ribs are covered with strong imbricating processes, which are oftentimes considerably produced. These characters correspond with those given by Dr. Geinitz in his 'Versteinerungen,' but *Avicula Kasanensis*, Geinitz, can only be reckoned a coarser variety of this species.

It is not common in the compact-limestone, but sometimes occurs very plentifully in the shell-limestone of Humbleton and other localities. In the higher deposits it has never been known to occur.

19. *GERVILLIÁ ANTIQUA*, Münst. = *G. INFLATA*, Brown, sp.—At present I am unable to decide which of the above names ought to be retained for this species, as the figures given by Goldfuss are not very good representations of it, and are referred by Dr. Geinitz to the following, *G. ceratophaga*. Many other eminent naturalists also are of opinion that *antiqua* is only a variety of the latter; but I am not at liberty at present to adopt this opinion.

It is altogether a very much broader and a more inflated shell than the following species. The posterior margin is never so much arcuated or forked, and the wings are never so strongly and distinctly marked off from the body of the shell as they are in *G. ceratophaga*. The cartilage-pits, generally three or four

* Through an unfortunate oversight, an erroneous date was given to the publication of this Catalogue in a former number of the 'Annals.' Instead of Aug. 10th, read Aug. 17th, 1848.

in number, are, from increasing in width with the growth of the hinge-margin, rather triangular, and are placed directly across the area. They are never oblique in the specimens I have examined, as represented in the 'Perm. Mon.,' and the first pit invariably stretches directly between the umbones. In the clumsily-grown *tumida*, which is only a stunted form of this species, they are placed closer together and are more numerous, though the hinge-line is much shorter. In the Table, the *Bakevella carinata*, King, has been placed erroneously as a synonym of the next shell; but it is only the young of the present species, which has oftentimes two strong, raised, diverging lines running from the umbones to each side of the byssal notch.

Through the kindness of Mr. Binney I have made the following notes on Capt. Brown's species of *Avicula*:—

The three specimens of *Avicula Binneyi* belong undoubtedly to the *A. antiqua* of the Durham magnesian limestone. *A. inflata* is identical with the preceding. The hinge-area is very much inclined, perhaps from the valves being partially open. The only difference perceivable in *A. discors* is that the area is not so much developed, and the umbones are closer in consequence. The right valve also appears smaller than usual, but this may be from compression. Two other specimens of *A. antiqua* in the same collection were much larger and better preserved than the preceding. They have the posterior margin also more forked, and there is a deepish constriction running from the umbones to the ventral margin.

Great development of the hinge-area cannot be considered a specific character in this species, nor in some of the following; for when this area is greatly increased, there is generally a very stunted growth of some other part of the shell.

This species and the following may be very safely and most conveniently placed in the above genus. There seems to be no necessity for instituting a new one for their reception.

In the compact-limestone rare, but rather plentiful in some localities in the shell-limestone. In this district it has not yet been detected in the higher members of the limestone, which are probably the true equivalents of the Permian marls of Manchester and its neighbourhood, where this little shell seems to be very common.

20. *GERVILLIA CERATOPHAGA*, Schloth.—It is of a more elegant form than the preceding, and the tumid part of the shell is more distinctly characterized and produced to a greater length posteriorly than in the *G. antiqua*. The hinge-line is very long, and produced posteriorly to a fine point, whence it curves beautifully downwards, forming a deep curve with the tumid part of the

shell. The hinge-area is not so broad and more parallel than in the foregoing species, and its cartilage-pits, placed directly across the margin, and not obliquely to it, as described in the 'Monograph,' have an oblong appearance. The first pit is placed immediately between the umbones, and only in one instance have I seen more than three, though it is stated by Mr. King that there are sometimes six. This species is very imperfectly represented in the 'Perm. Mon.,' for not one of the figures gives a correct idea of the perfect appearance of this shell; and the cartilage-pits are represented as being oblique, which is quite contrary to what I have always observed. The *Bakevellia Sedgwickiana* cannot be considered even as a variety of this species. The surface of *G. antiqua* and *ceratophaga* is, when perfect, covered with beautiful, raised, distant lines; and this is the commonest style of shell-ornament that occurs in the Permian rocks.

It is rather common in the shell-limestone of several localities.

21. MYALINA HAUSMANNI, Goldfuss.—It seems advisable to adopt the specific name given to this shell by Goldfuss, as it is the first that is accompanied with a good description and figure. It has very often been mentioned, under another name, in a few English works, but we have no accurate or admissible description of it, and no figure that I am acquainted with that can claim earlier date than those in the 'Perm. Mon.' The above is a well-established name on the continent, and has been so for very many years.

It is not possible any longer to separate this common shell into two species, for there is no character by which they can be distinguished specifically. The examples that occur in the lower and middle beds of limestone are narrower and appear more elongated than those which occur in the upper deposits. The latter are generally broader and more ovate in form, but in all essentials they are alike. They have all occasionally the ligamental area very much produced; but this is not a specific character, for individuals often occur with a narrow hinge-line. The squamose appearance of these shells is not the true outer surface, for the latter is most beautifully adorned with very fine and regular lines of growth. It is only in finely preserved specimens from the upper beds that this character is shown to perfection, but it may be traced on very many specimens from the shell-limestone.

The existence of this mytiliform shell in such great plenty in the shell-limestone, and its generally rough and stunted appearance, would seem to lead to any other than the conclusion that this deposit of shell-limestone was of 'pelagic' origin. The entire fauna of this limestone is indeed so decidedly littoral in character, and so clearly of shallow-water origin, that I could

not, many years ago, refrain from pointing it out, and no statement has been made since that invalidates this conclusion.

This species is most abundant in the shell-limestone, and occurs sparingly in many of the upper beds of limestone.

22. *MACRODON STRIATA*, Schloth.—The form of the teeth of this shell agrees with that of *Macrodon*, Lycett and Morris, and the general shape is also very similar. The hinge-area is often very much developed in specimens whose growth is somewhat stunted round the free margins of the shell. This is the form best known in England (*Arca tumida*, Sow.). The regularly-grown shell is one of the most beautiful, both in form and ornament, of those from the Permian rocks. The smooth or partially smooth examples, *A. Kingiana*, can often be traced on the umbonal regions of genuine *M. striata*. The specimens figured in the 'Perm. Mon.' give a very poor idea of the shape and beauty of ornamentation of this common species.

In the shell-limestone, rather common at Tunstall, and occurring frequently in all the localities mentioned in the Table. It appears to be a much commoner species in England than in Germany.

23. *LEDA SPELUNCARIA*, Geinitz.—It is not to be disputed that Geinitz's figure and short description of this little shell have priority over Mr. King's: therefore I feel no hesitation in adopting it, although it is placed among the synonyms in the 'Perm. Monograph.' It occurs rather sparingly in the upper beds of limestone, and more rarely in the shell- and compact-limestone.

The *Nucula Tateiana*, King, is mentioned here that it may not be lost sight of. It is impossible to adopt it as an authenticated species, for, according to Mr. King's own words, the description is drawn up from "the dorsal half" of a specimen only. Baron Schauroth has favoured me with some specimens of a true Permian *Nucula* (*N. Beyrichii*) from the zechstein of Germany; and this renders it very likely that on some future occasion specimens may occur in our limestone.

24. *SOLEMYA NORMALIS*, Howse. Pl. IV. fig. 7*.

"Shell transversely oval, narrow, slightly arcuated; beaks indistinct near the posterior end; anterior (much) elongated; muscular impressions large, slight; a few raised lines diverging from the beaks to the free margins on the cast; external surface smooth."

I obtained a single left valve of this very rare shell on a block of Humbleton Hill shell-limestone, on Good Friday, 1845. I afterwards described it, in the above words, in the Tyneside Catalogue. It was there pointed out, that though it bears a slight resemblance to *S. biarmica*, yet the beak is nearer

* The figure in the accompanying plate does not represent the rounded appearance of the anterior extremity as correctly as could be desired.

the posterior end, and the shell is much narrower than in the Russian species. The anterior is also more elongated, and the surface is quite smooth. It is also very much smaller. All these differences are borne out by another single left valve lately found by Mr. Kirkby at Tunstall.

Mr. King had the loan of the above specimen for several months; and I find he has, in the 'Perm. Monog.,' attempted to describe and to figure a species which he identifies with this. But he has succeeded very badly, both in the description and in the figure, which does not represent my species. Baron Schauroth has attempted, in one of his excellent papers, to identify a German specimen with Mr. King's description and figure; but he found so little character in the latter, that he was obliged to leave the matter in doubt. Certainly the *S. Phillipsiana*, King, is not worthy to be considered even a synonym.

Two left-valves have been found in the shell-limestone of Tunstall and Humbleton.

25. SOLEMYA ABNORMIS, Howse. Pl. IV. figs. 8, 9.

"Shell transversely oval; beaks not prominent; posterior short, narrow, rounded; anterior elongated, rounded, much wider than the posterior; surface slightly wavy concentrically, plain; muscular impressions obliquely placed, deep."

So different did this *Solemya* seem when I first described it, that I never for a moment thought of drawing a comparison between it and the *S. biarmica*; and although I have received some fine casts of German specimens of the latter, I must own that I cannot identify them with either of the above species. The *S. abnormis* is very pointed posteriorly, and the anterior is much produced and very broad. It is also much flattened, and all the specimens I have examined are quite smooth. The German casts are rather tumid, slightly arcuated, and have the valves rounded and covered with strong lines of growth near the anterior margin. It is therefore very doubtful whether the shells placed as synonyms in the Table are referable to this species.

It cannot certainly be referred to the *S. biarmica*, Vern., of the Russian Permian rocks, until it be known whether that species really is a gaping shell or not. With these uncertainties, I hesitate to alter the name originally given to it in the Tyneside Catalogue.

It remains to be stated, that Mr. King identifies this species with the *S. biarmica*; but the figure given in the 'Perm. Mon.' pl. 16. fig. 7, represents no *Solemya*, but a young specimen of the *Allorisma elegans*, King.

I have taken specimens of the above shell at Whitley, in the compact-limestone; at Tunstall and Silkworth, in the shell-limestone; and Mr. Kirkby has recently obtained a specimen from Humbleton.

26. *AXINUS DUBIUS*, Schloth.—Baron Schauroth has recently shown that the specific name *dubius*, originally applied to this shell by Schlotheim, has priority of all others, even of the now well-known Sowerbian epithet *obscurus*. It is therefore necessary to adopt this so-long-neglected name.

Under this name there may be very conveniently placed the following species of authors:—*Axinus obscurus*, Sow.; *A. parvus*, *pusillus*, *productus*, *undatus*, *elongatus*, *rotundatus*, and *Lucina minima*, Brown; *Schizodus Schlotheimi*, Geinitz, and *Schizodus truncatus*, King.

Remarks on Mr. Binney's Specimens.—Two small casts of *Ax. parvus* belong without doubt to the above.—*A. productus* resembles the form which King has separated under the specific name *truncatus*. It is rather more produced in front, and more truncated behind. It cannot claim to be more than a regular growth of *dubius*.—*A. undatus* and *A. elongatus* belong also to the above. They present no peculiar characters.—*A. pusillus* and *Lucina minima* appear to be the young of the foregoing species.

In the 'Perm. Mon.' under four specific names (pl. 15. f. 23–32), are very good representations of some of the forms of this characteristic species; but the peculiar ornament of the shells of this genus is, I think, not represented.

In the upper beds of limestone it occurs of great size, some specimens being 2 inches in length. It is rather plentiful in the shell-limestone, and rare in the compact.

27. *ASTARTE? VALLISNERIANA*, King.—The specimens of this shell which I have collected at Whitley are rather more triangular than the figure in the 'Perm. Mon.' and very much resemble, both in the general form and ornament of the valves, some young specimens of the recent *Venus striatula*. The hinge-line is furnished with a deep triangular cartilage-pit, and the character of the superficial ornament is preserved on the casts.

I am not able to confirm the existence of *Astarte Tunstallensis*, King, in our limestone; and as it bears considerable resemblance to the preceding, and is not strongly characterized, its admission into the Permian fauna, as a distinct species, may be safely objected to till less equivocal specimens are obtained.

The *Astarte Vallisneriana* occurs in this district in the compact-limestone only; and, according to Baron Schauroth, it is found in the equivalent deposit near Gera in Germany.

28. *MYOCONCHA COSTATA*, Brown.—I find nothing in the form of the teeth of this shell that requires it to be removed from the genus *Myoconcha*. So far as I have been able to ascertain, there is only one oblique cardinal tooth in the right (?) valve, which fits into a corresponding depression of the left.

The examples from this district agree very accurately with the original specimens described by Capt. Brown. In general, all the specimens are strongly marked with several oblique radiating ribs or planes over the posterior surface. Some specimens occur at Byer's Quarry quite smooth, and more ovate than usual. These have, I see, been prospectively named *Pleurophorus ovatus* in the 'Perm. Mon.' They do not appear to differ specifically from the foregoing.

It ranges through all the limestone series, but is most plentiful in the shell-limestone of Tunstall and Humbleton.

29. *MYOCONCHA MODIOLIFORMIS*, King.—It has been proposed by Baron Schauroth to unite this species with the *Modiola Pallasii*, De Vern., a species which is said to be without teeth. Mr. King has also referred it to the edentulous genus *Cardiomorpha*, De Koninck. For want of Russian specimens to compare with it, I think it better to leave it under its present specific name, especially as some specimens which I have examined show an appearance of a tooth in the right valve, and its other general characters are the same as in the preceding species. It may with safety therefore be included in the same genus as *costata*.

In one of Mr. Kirkby's specimens, the ligament, which is finely preserved, is comparatively large. Some specimens of the same shell from the equivalent deposit of Poessneck, kindly forwarded to me by Baron Schauroth, have the ligament in a fine state of preservation.

It is found in the shell-limestone only, where, sometimes associated with its congener, *M. costata*, it is rather plentiful.

30. *MYACITES ELEGANS*, King.—"Schlotheim's name *Myacites*" (writes Mr. King, 'Perm. Mon.' p. 196) "implies that the shells so called are fossil Myas: as this is not the case, the name cannot stand." And just above this note the same author states that "the name (*Allorisma*) was proposed under the persuasion that the cartilage-fulcra of the genus varied in position according to the species; this is now known to be an error: the name is, however, still retained, notwithstanding its being a misnomer." The conclusiveness of this reasoning seems to have had its effect upon all careful English naturalists, for I find *Myacites* now adopted, and *Allorisma* consigned to mere oblivion. It still, however, lingers on the Continent, shortly to become for ever extinct.

Several authors think this species is only the *Panopæa lunulata*, Keyserling; but I am not able to refer it to that species for want of original Russian specimens to compare it with. This species belongs to the genus *Myacites*, restricted as it is by Morris and Lycett.

The specimen which Mr. King has figured as *Solemya biar-*

mica, De Verneuil, Perm. Mon. pl. 16. fig. 7, is only a young specimen of *M. elegans*.

It occurs very sparingly in the shell-limestone of Tunstall and Humbleton.

31. *EDMONDIA ELONGATA*, Howse. Pl. IV. figs. 10, 11, 12, 13.

“Shell elongated oval; beaks prominent, near the anterior end; anterior short and rounded; posterior elongated, the dorsal margin on a line with the beak; surface convex, covered with strong concentric lines of growth; hinge without teeth; umbonal cavity divided longitudinally by an elongated, thin, slightly curved visceral plate, depending towards the cavity of the shell.”

The above is the original description of this shell given in the ‘Tyneside Catalogue.’ It points out one peculiarity of this species and genus which appears to be generally misunderstood by authors:—The shelly process situated in the umbonal cavity is supposed to be a cartilage-plate, and to belong to the hinge. In Mr. Woodward’s excellent Manual, it is suggested, with doubt, that the shells of this genus were furnished with an ossicle. An examination of several cross-sections of shells belonging to this genus does not appear to substantiate this conclusion. The shell also of most species is very thin, and the valves are united by a strong external ligament, as a Permian specimen from Germany and some examples of the carboniferous *E. arcuata* in my possession clearly show. It could not, therefore, require an internal cartilage of such a size. But these are, I think, not cartilage-plates, but internal processes equivalent to the subumbonal or spatula-shaped blade of the genus *Pholas*, which projects into the cavity of the shell, and forms an advanced point of attachment for a visceral, or perhaps for the pedal muscle. The general configuration of this shell also suggests that it was a burrowing mollusk.

It is not a very common species in the shell-limestone of Tunstall, Humbleton, &c., and occurs also in the equivalent deposit of Poessneck.

32. *TELLINA DUNELMENSIS*, Howse. Pl. IV. figs. 14, 15.

“Shell elliptical; beaks small, not prominent, situated near the anterior end, which is somewhat rounded; posterior elongated, more acute than the anterior; two cardinal teeth in each valve.”

The specimens of the shells which I have been able to examine do not permit much to be added to the above characters. The specimen figured in the ‘Perm. Mon.’ is imperfect, for the posterior of this shell is rather acute, perhaps not quite so much so as in the figures, Pl. IV. figs. 14, 15. The valves are generally found together, and spread out, which is the case also with several other Permian species. It shows that they were provided with a very strong ligament.

In the shell-limestone at Humbleton.

[To be continued.]